Interpretation of paramagnetic ...

spectroscope frequency and $\varepsilon_{1,2}$ are the energies in the states $\psi_{1,2}$. If ψ_{-s}, $\psi_{-s+1}\cdots\psi_{s}$ forms any orthonormalized set of wave-functions in the given space, one can go over to a new space R^2 of the order $(2s+1)^2$ based on all possible normal products $\psi_i\psi_j$. The transition from operator $\mathcal{H}$ to operator $\mathcal{H}'$ acting in R^2 is described by

$$\mathcal{H}\psi_1=\varepsilon_1\psi_1 \text{ и } \mathcal{H}\psi_2=\varepsilon_2\psi_2,$$

$$\mathcal{H}'(\psi_i\psi_j)=(\mathcal{H}\psi_i)\psi_j-\psi_i(\mathcal{H}\psi_j) \qquad \mathcal{H}'\psi_1\psi_2=(\varepsilon_1-\varepsilon_2)\psi_1\psi_2.$$

$\varepsilon_{1,2}$ are the eigenvalues of $\mathcal{H}$, $\varepsilon_1-\varepsilon_2$ is that of $\mathcal{H}'$. For R^2, a semi-space of R^2 one obtains .

Card 2/5

$$\det(\mathcal{H}'-\nu E)=\det(\mathcal{H}'(v)-\nu E)=\det\left(E+\frac{1}{\nu}\mathcal{H}'(v)(E-E_1)\right)\times$$
$$\times(\mathcal{H}'(v)-\nu E)\left(E+\frac{1}{\nu}(E-E_1)\mathcal{H}'(v)\right)=$$
$$=(-\nu)^{2n+1}\det\left(S_z'H-E_1B'(v)E_1+\frac{1}{\nu}B'(v)(E-E_1)B'(v)-\nu E_1\right)= \quad (6)$$
$$=(-\nu)^{2n+1}\det(S_z'H-B).$$

with

$$\langle ij|B|kl\rangle=\langle i|B(v)|k\rangle\delta_{jl}-\langle j|B(v)|l\rangle\delta_{ik}-$$
$$-\frac{1}{\nu}(\langle i|B(v)|j\rangle\langle l|B(v)|k\rangle\delta_{jl}-\langle i|B(v)|j\rangle\langle k|B(v)|l\rangle\delta_{jk}- \quad (7).$$
$$-\langle j|B(v)|l\rangle\langle l|B(v)|k\rangle\delta_{il}+\langle j|B(v)|i\rangle\langle k|B(v)|l\rangle\delta_{il})+\nu\delta_{ik}\delta_{jl}.$$

Card 3/5

The operator $P = \sum_{\mu=0}^{s(2s+1)} H^{2\mu} P_{2\mu}$ is introduced, for which

$$P_{2s(2s+1)} = (g_x^2 H_x^2 + g_y^2 H_y^2 + g_z^2 H_z^2)^{s(2s+1)} = H^{2s(2s+1)}.$$

This polynomial can be represented by the operators A and B, as

$$P_{2s(2s+1)-2} = -\frac{1}{2} \sum_{i \neq j,\ k \neq l} \frac{1}{(i-j)(k-l)} \langle ij|B|kl\rangle\langle kl|B|ij\rangle =$$
$$= (AB(v),\ B(v)) + av^2. \qquad (8).$$

It is shown how the B-matrix can be determined so that for any v (v denotes a rotation that turns the vector $\{g_x H_x, g_y H_y, g_z H_z\}$ into the OZ direction) the corresponding ν-value can be found. If this ν is compared

Card 4/5

with the true frequency, the coefficients of B and the g-factors can be found. As an example the paramagnetic resonance of Cr^{3+} in TiO_2 is considered ($\nu = 0.5\ cm^{-1}$) and the coefficients of the secular equation are calculated. There are 1 table and 1 figure.

SUBMITTED: July 23, 1962

Card 5/5

TSUKERMAN, B. I.; VINETSKAYA, M. A.

Interpretation of paramagnetic resonance spectra in crystals.
Fiz. tver. tela 5 no.1:129-136 Ja '63. (MIRA 16:1)

(Paramagnetic resonance and relaxation)
(Crystals)

VINETSKAYA, N.I.

Salinity of water in the Northern Caspian. Trudy VNIRO 38:26-51 '59. (MIRA 13:4)
(Caspian Sea--Salinity)

VINETSKAYA, N.I.

Production of phytoplankton in the northern part of the Caspian Sea. Gidrokhim.mat. 29:131-139 '59. (MIRA 13:5)

1. Kaspiyskiy nauchno-issledovatel'skiy institut Morskogo rybnogo khozyaystva, Astrakhan'.
(Caspian Sea--Phytoplankton)

VINETSKAYA, N.I.

Water level variations in the Caspian Sea and salinity conditions in its northern part during the past 20 years. Trudy Okean. kom. 5:118-124 '59. (MIRA 13:6)
(Caspian Sea--Salinity)

VINETSKAYA N. I.

VINETSKAYA, N.I.

Effect of "green manure" on the production of organic matter and hydrochemical conditions in ponds of the "IAmat" Fish Farm. Trudy VNIRO 32:29-53 '56. (MIRA 10:10)
(Volga Delta--Fish ponds)
(Fresh-water flora)

SOL'TS, L.N.; VINETSKAYA, P.G.[Vinets'ka, P.H.]

Quality of sterile solutions prepared in the pharmacies of Kharkov. Farmatsev. zhur. 18 no.2:74-77 '63. (MIRA 17:10)

1. Kontrol'no-analiticheskaya laboratoriya aptechnogo upravleniya Khar'kovskogo oblastnogo otdela zdravookhraneniya.

VINETSKAYA, Ye.Ya., kand.khim.nauk

Investigating the specific external surface of woodpulp suspensions in the beating process. Bum.prom. 33 no.11:5-6 N '58. (MIRA 13:8)

(Woodpulp)

VINETSKAYA, Ye.Ya., kand. khim. nauk.

Adsorption method for determining the specific external surface of pulp suspensions during grinding. Bum. prom. 33 no.4:6-9 Ap '58. (MIRA 11:4)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut Goznaka.
(Woodpulp—Testing) (Surface) (Adsorption)

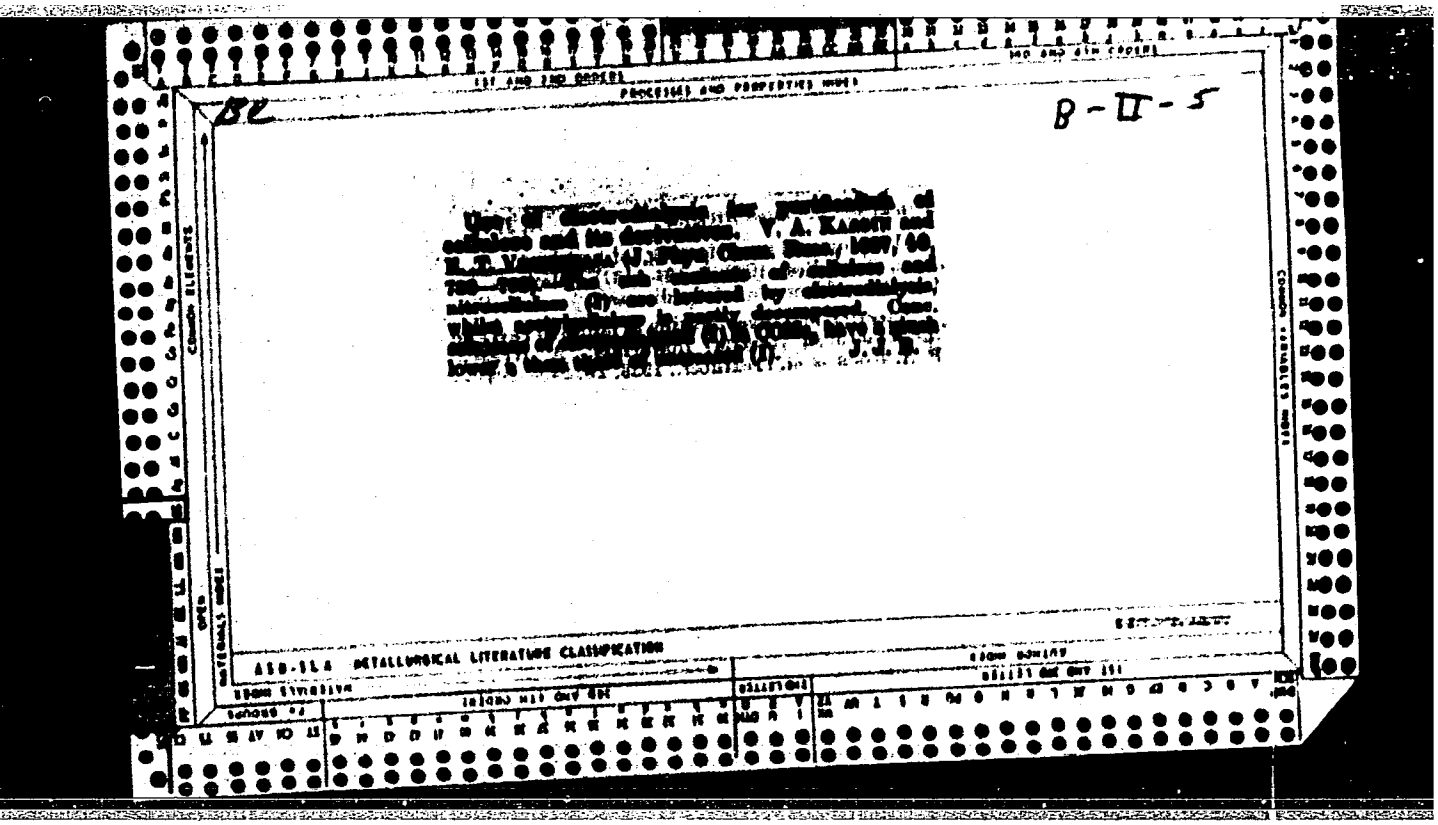
VINETSKAYA, Ye.Ya., kand.khim.nauk

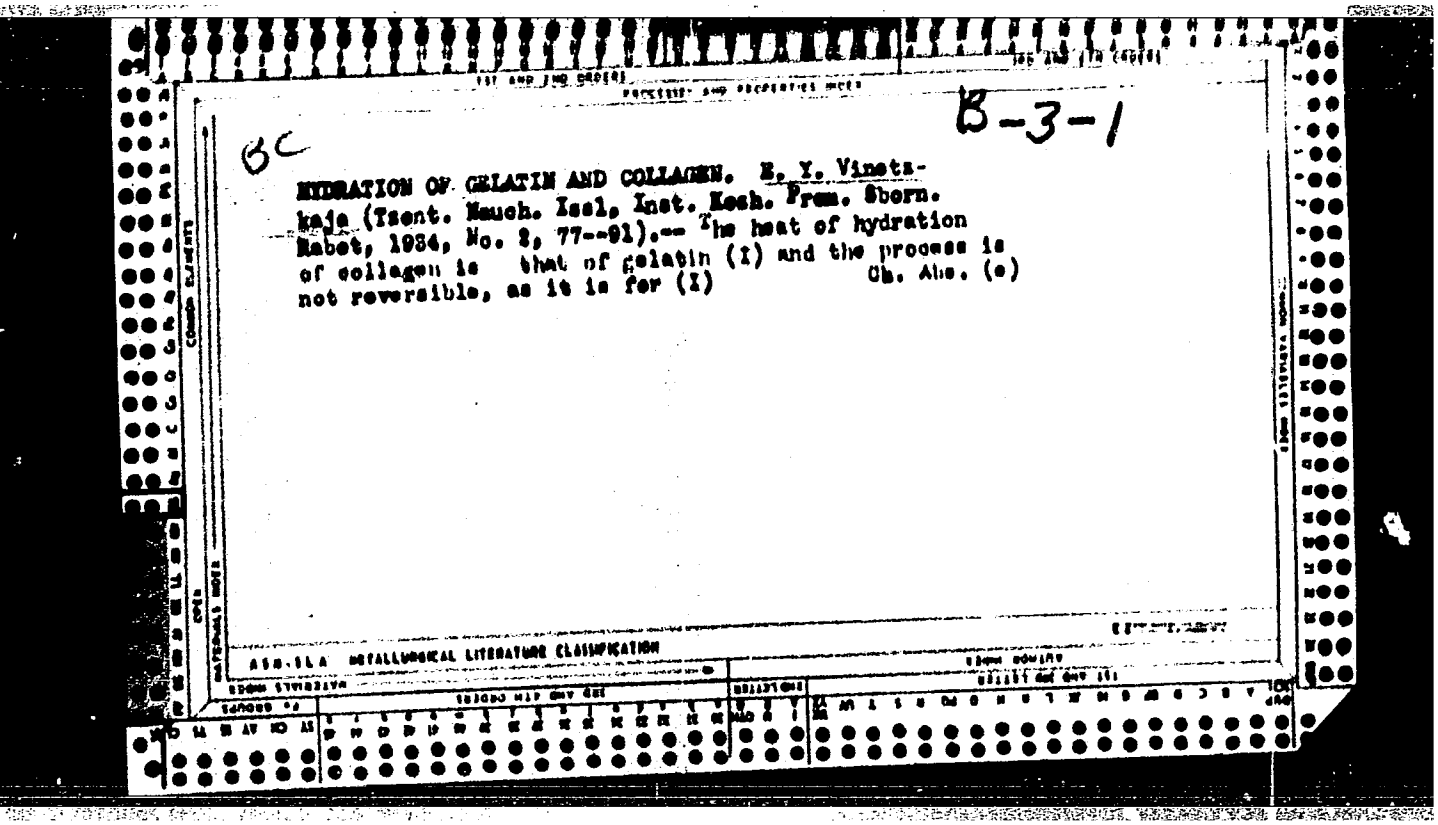
Rapid refractometric method for determining the concentration of solutions. Bum.prom. 34 no.2:5-7 F '59. (MIRA 12:4)
(Refractometry) (Solution (Chemistry))

VINETSKAYA, Ye.Ya., kandidat khimicheskikh nauk; KUPLENSKAYA, A.A., kandidat khimicheskikh nauk.

Photometric method of determining the resin acid content in resin size. Bum.prom. 31 no.1:10-13 Ja '56. (MLRA 9:5)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut GOZNAKA.
(Photometry) (Sizing (Paper))



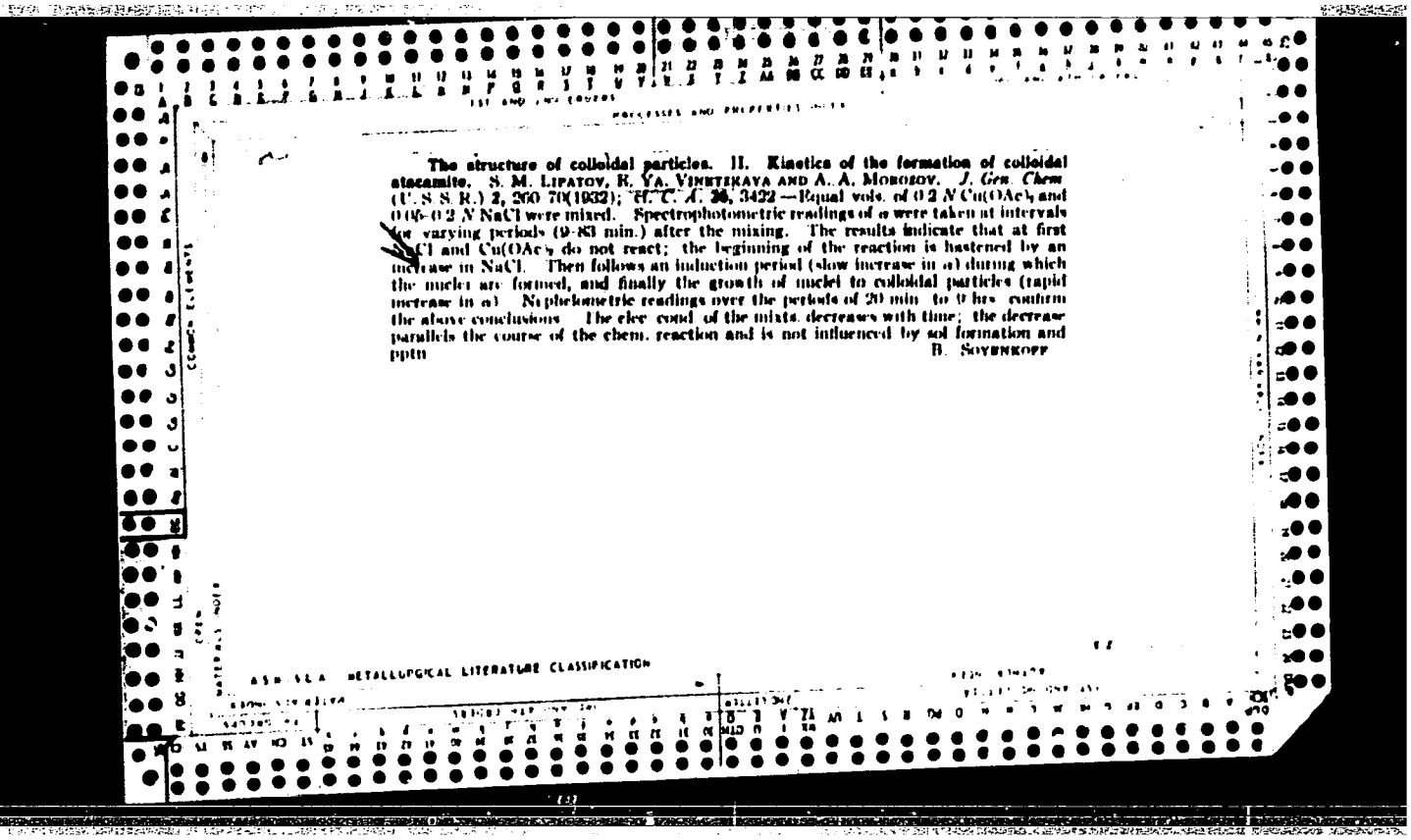


B-3-1

BC

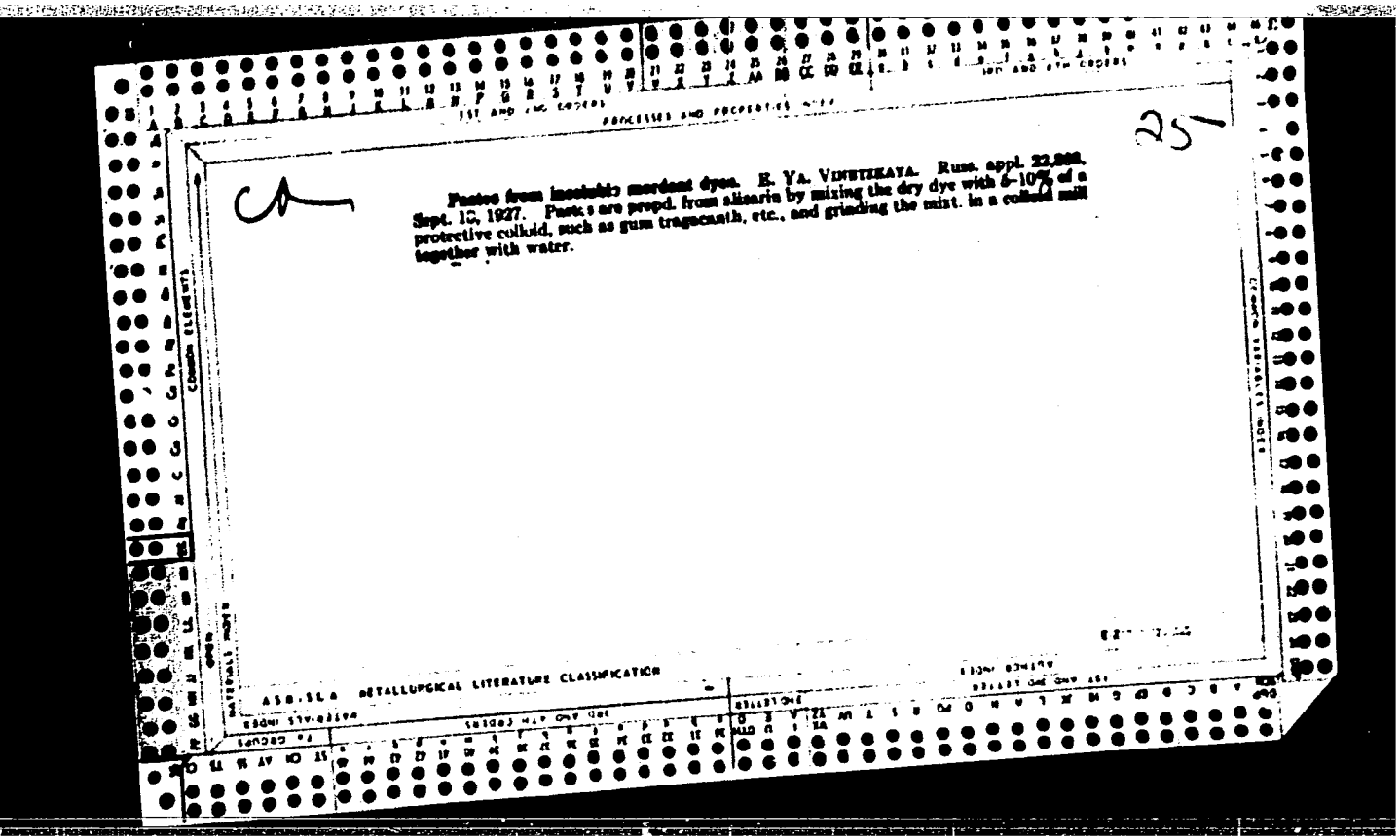
HYDRATION OF GELATIN AND COLLAGEN. E. Y. Vinetskaja (Tsent. Nauch. Issl. Inst. Koch. Prom. Sborn. Rabot, 1934, No. 8, 77--91).-- The heat of hydration of collagen is that of gelatin (I) and the process is not reversible, as it is for (I) Ch. Abs. (e)

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

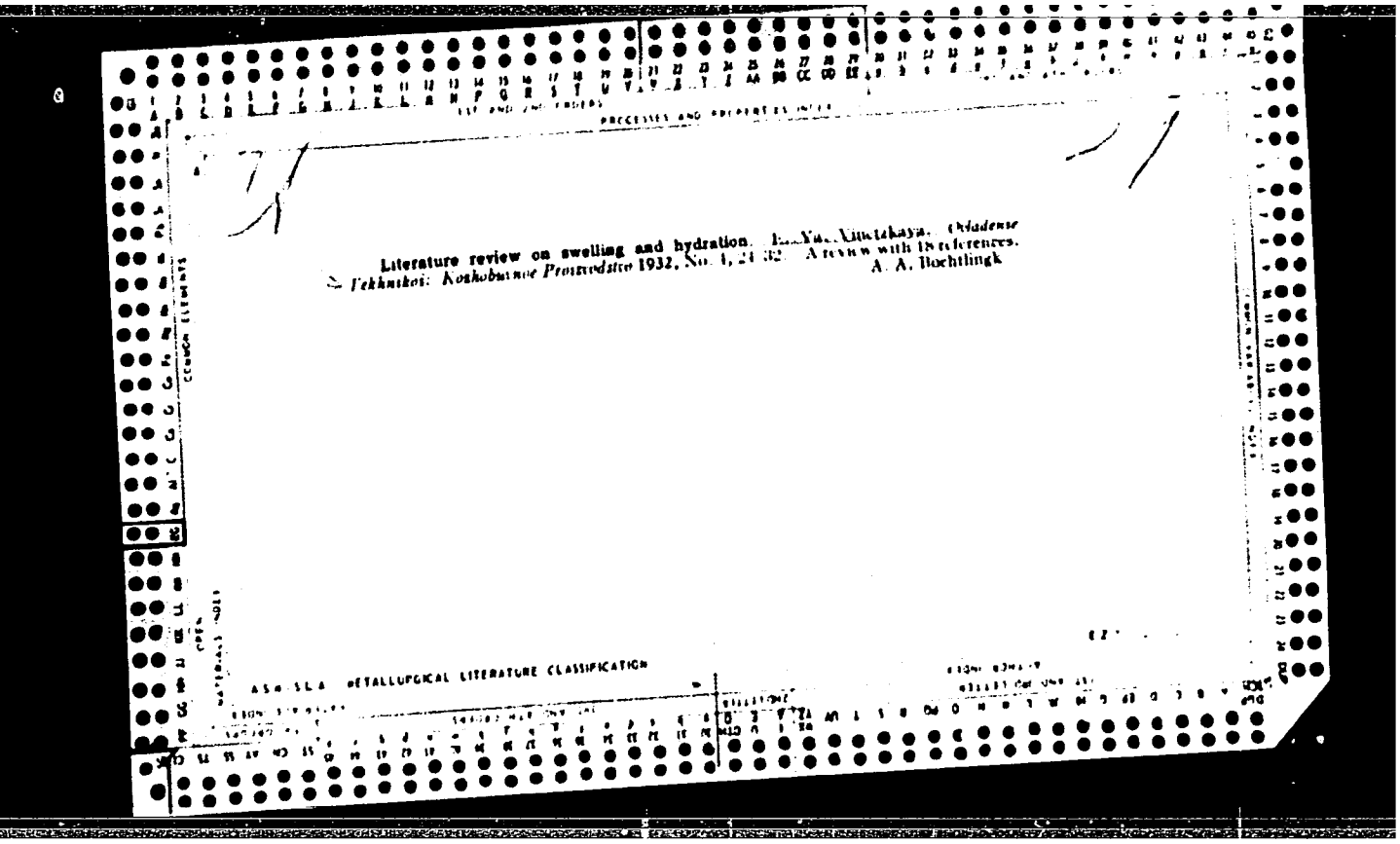


The structure of colloidal particles. II. Kinetics of the formation of colloidal atacamite. S. M. LIPATOV, R. YA. VINETSKAYA AND A. A. MOROZOV. *J. Gen. Chem.* (U. S. S. R.) **2**, 360-70(1932); cf. *C. A.* **26**, 3422.—Equal vols. of 0.2 *N* $Cu(OAc)_2$ and 0.06-0.2 *N* NaCl were mixed. Spectrophotometric readings of α were taken at intervals for varying periods (9-83 min.) after the mixing. The results indicate that at first NaCl and $Cu(OAc)_2$ do not react; the beginning of the reaction is hastened by an increase in NaCl. Then follows an induction period (slow increase in α) during which the nuclei are formed, and finally the growth of nuclei to colloidal particles (rapid increase in α). Nephelometric readings over the periods of 20 min. to 9 hrs. confirm the above conclusions. The elec. cond. of the mixts. decreases with time; the decrease parallels the course of the chem. reaction and is not influenced by sol formation and pptn.

B. SOYENKOFF

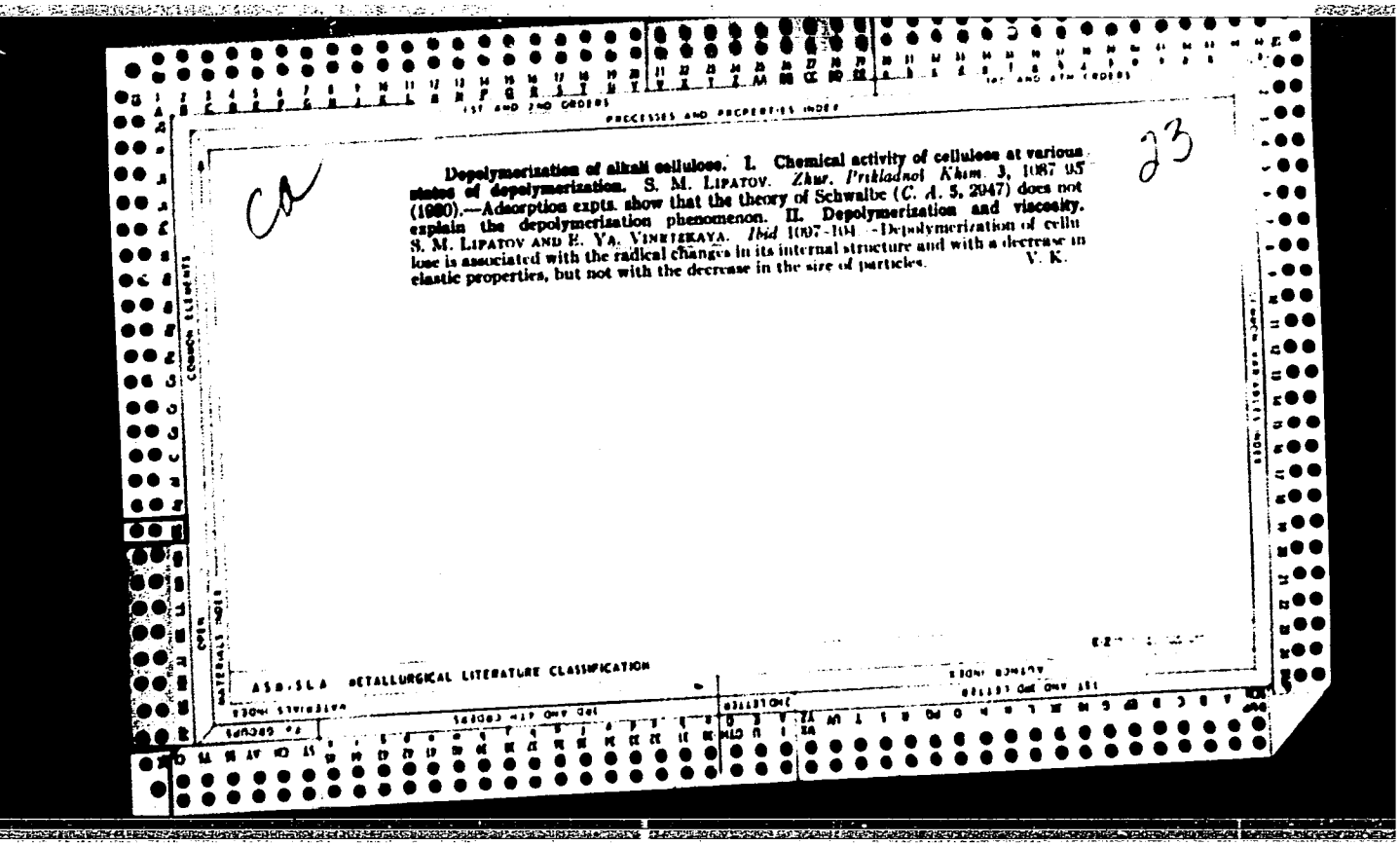


Pastes from insoluble mordant dyes. E. Ya. Vinbitskaya. Russ. appl. 22,888, Sept. 15, 1927. Pastes are prepd. from alizarin by mixing the dry dye with 5–10% of a protective colloid, such as gum tragacanth, etc., and grinding the mixt. in a colloid mill together with water.

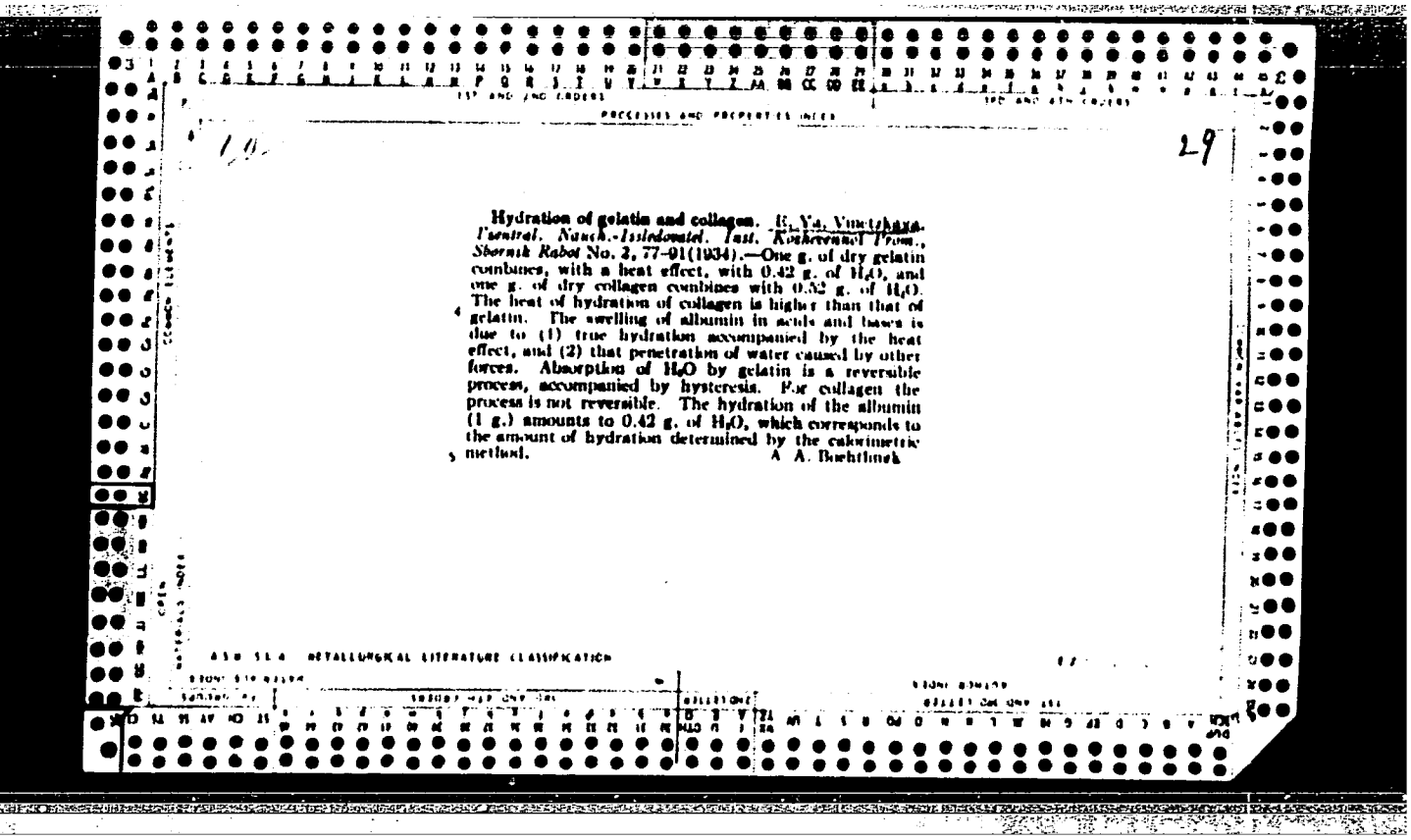


Literature review on swelling and hydration. L. Ya. Lipetskaya. *Obzornaya Tekhnika: Koshobumazhnoe Proizvodstvo* 1932, No. 1, 21-32. A review with 18 references.
A. A. Bochtlingk

METALLURGICAL LITERATURE CLASSIFICATION



Depolymerization of alkali cellulose. I. Chemical activity of celluloses at various states of depolymerization. S. M. LIPATOV. *Zhur. Prikladnoi Khim.* 3, 1087-95 (1930).—Adsorption expts. show that the theory of Schwalbe (*C. A.* 5, 2947) does not explain the depolymerization phenomenon. II. Depolymerization and viscosity. S. M. LIPATOV AND E. YA. VINETSKAYA. *Ibid* 1097-104.—Depolymerization of cellulose is associated with the radical changes in its internal structure and with a decrease in elastic properties, but not with the decrease in the size of particles. V. K.



Hydration of gelatin and collagen. K. Ya. Yunchaya. *Tsentral. Nauch.-Issledovatel. Inst. Kozhevennoi Prom., Sbornik Rabot* No. 3, 77–91(1934).—One g. of dry gelatin combines, with a heat effect, with 0.42 g. of H_2O, and one g. of dry collagen combines with 0.52 g. of H_2O. The heat of hydration of collagen is higher than that of gelatin. The swelling of albumin in acids and bases is due to (1) true hydration accompanied by the heat effect, and (2) that penetration of water caused by other forces. Absorption of H_2O by gelatin is a reversible process, accompanied by hysteresis. For collagen the process is not reversible. The hydration of the albumin (1 g.) amounts to 0.42 g. of H_2O, which corresponds to the amount of hydration determined by the calwimetric method.

A. A. Buchtinek

VINETSKIY, A.S., inzh.

Road pavements made of prestressed reinforced concrete. Avt. dor. 22 no.6:26 Je '59. (MIRA 12:9)
(United States--Pavements, Concrete)

VINETSKIY, A.S., inzh.

Cars with pneumatic tires in Paris subways. Transp. stroi. 8 no.3:24-25 Mr '58. (MIRA 11:4)
(Paris--Subways) (Tires, Rubber)

VINETSKIY, A.S., inzh., referent.

Transporting concrete in automatic mixers and the influence of the continuous mixing on its quality (from "Pit and Quarry"). Bet. i zhel.-bet. no.1:35-36 Ja '58. (MIRA 11:2)
(Concrete--Transportation)
(Mixing machinery)

VINETSKIY, A.S., inzh.

Operation of machines for unloading rock products. Mekh. stroi. 17 no.10:26 O '60. (MIRA 13:10)
(Loading and unloading--Equipment and supplies)

28(1) SOV/118-59-1-12/16

AUTHORS: Mel'nikov, N.V., Corresponding Member of the AS USSR, Vinetskiy, K.E. and Potapov, M.G., Candidates of Technical Sciences.

TITLE: On the Use of Continuous-Motion Equipment in the Open Mining Pits (O primenenii oborudovaniya nepreryvnogo deystviya na otkrytykh gornykh razrabotkakh)

PERIODICAL: Mechanizatsiya i Avtomatizatsiya Proizvodstva, 1959, Nr 1, pp 46-50 (USSR)

ABSTRACT: The authors emphasize the need to establish various systems of rotor excavators, adaptable for use in severe climatic conditions and to design continuous-motion conveyer equipment. They describe the advantages of rotor excavators compared with chain excavators, especially when they are utilized in conjunction with the above-mentioned conveyer equipment. As background information, the authors mention output figures and locations of old coal and ore basins and deposits,

On the Use of Continuous-Motion Equipment in the Open Mining Pits

and of new basins and deposits to become operative within the next 10 years (table 3 on page 49). These new deposits will need about 408 additional excavators including 312 of the rotor type. Introduction of extensive continuous-motion conveyer equipment can eliminate the need for about 1,000 dump-trucks, a great deal of other transport and equipment and over 1,500 km of railroad tracks. A complex unit of such type, of 3,000 m^3/h capacity, has already been designed by the Novo-Krematorskiy mashinostroitel'nyy zavod (Novo-Kramatorsk Machine Building Plant). Regarding new developments: The Yuzhnyy gornoobogatitel'nyy kombinat (The Southern Ore-Concentration Combine) has been put into service in the Krivoy Rog Basin. Its annual capacity will reach 9,000,000 tons. The Lebedinskiy and the Mikhaylovskiy open coal mines of the Kursk Magnitnaya Anomaliya (Kursk Magnetic Anomaly) will be put into operation in 1960.

On the Use of Continuous-Motion Equipment in the Open Mining Pits

Their capacity is expected to reach 10,500,000 tons per year. The construction of a new Chernomorskiy Rudnik (Black Sea Mine) of about 5,000,000 tons annual capacity is planned in the area of the Kerch Iron Ore Basin. Soon, open ore pits will be opened in the Lisakovskiy, Sarbayskiy, Kacharskiy and Ayatskiy deposits in the Kazakhskaya SSR. It is estimated that their capacity will exceed 30,000,000 tons per year. Further, open manganese ore pits will be opened up in the Nikopol' Basin; by 1965 they are expected to have produced 70-80% of the whole output of manganese ores obtained in that basin. There are 4 tables, 2 diagrams.

VINETSKIY, L.M., inzh.

Plastic boards for manual cutting of materials. Kozh.-obuv. prom. 7 no.4:33-34 Ap '65. (MIRA 18:6)

VINETSKIY, L.M.; VERSHAL', P.I.

Use of plastics for the manufacture of hollow shoe trees. Kozh.obuv. prom. 4 no.11:37-38 N '62. (MIRA 15:11)
(Plastics)

SHLYAPINA, V.N.; VINITSKIY, L.Ye.; POPOV, G.G.

Stress-rupture strength of rubber-metal samples in shear. Zav.lab. 29 no.7:872-874 '63. (MIRA 16:8)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut zheleznodorozhnogo transporta.

(Rubber to metal bonding)

VINITSKIY, L.Ye.; BABITSKIY, B.L.; Prinimal uchastiye: MATUSEVICH, V.V.

Some characteristics of sound reflextion by shock absorber rubbers. Kauch. i rez. 22 no.6:38-39 Je '63.
(MIRA 16:7)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut zheleznodorozhnogo transporta.
(Rubber goods—Acoustic properties)

S/181/60/002/01/16/035
B008/B014

24.7700
24.7500

AUTHORS: Vinetskiy, R. M., Miselyuk, Ye. G.

TITLE: Determination of the Impurity Concentration in Germanium

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 1, pp. 67-69

TEXT: The authors describe a simple method of determining the impurity concentration in germanium. It is based on the following principle: The lattice-induced diffusion of impurities in germanium causes a temperature dependence of ρ (ρ - resistivity of the semiconductor), which has the form $\rho_{L_e} \sim T^{1.66}$ in n-type material and the form $\rho_{L_p} \sim T^{2.33}$ in p-type material (Ref. 2). Indices L_e and L_p show that this resistivity depends on the scattering from the n-type or p-type lattice. The fraction of impurity scattering in resistivity was determined at 100°K. For an experimental determination of $\log \frac{\rho}{\rho_L}$ (100°K) it is sufficient to measure

Card 1/3

Determination of the Impurity Concentration in Germanium

the resistivity of the sample at two temperatures, to find the quantity $\Delta \log \varrho$ and to subtract it from the standard values of $\Delta \log \varrho_L$. A theoretical calculation of the dependence of $\log \frac{\varrho}{\varrho_L}(100^\circ)$ upon the impurity concentration N is, however, also possible. The accompanying figure shows such dependences for n-type and p-type germanium alloyed with easily ionizable impurities at 100°K. After $\log \frac{\varrho}{\varrho_L}(100^\circ)$ has been determined experimentally, the corresponding impurity concentration is calculated by means of these curves. Verification of the method suggested has shown that it permits an estimation of the total concentration of easily ionizable impurities in germanium. Besides, the degree of compensation for impurities of the opposite type can be determined by this method. The lowest concentration of easily ionized impurities, which can be determined by this method, is 7.10^{13} cm^{-3} with a measuring accuracy of resistivity of $\geq$ 5%. The authors thank A. N. Kvasnitskaya for having prepared the germanium samples. There are 1 figure and 5 references, 1 of which is Soviet.

Card 2/3

Determination of the Impurity Concentration in Germanium

S/181/60/002/01/16/035
B008/B014

ASSOCIATION: Institut fiziki AN USSR, Kiyev (Physics Institute, AS UkrSSR, Kiyev)

SUBMITTED: May 4, 1959

Card 3/3

ACCESSION NR: AP4026428 S/0181/64/006/004/1048/1050

AUTHORS: Baranskiy, P. I.; Vinetskiy, R. M.; Kurilo, P. M.

TITLE: Anisotropy of the Hall coefficient in p-type germanium

SOURCE: Fizika tverdogo tela, v. 6, no. 4, 1964, 1048-1050

TOPIC TAGS: germanium, semiconductor, Hall coefficient, hole interaction, impurity concentration, impurity scattering, lattice scattering

ABSTRACT: Resistivity of the samples ranged from 0.13 to 37 ohm cm. Measurements were made at room temperature and at 77K. It was found that the degree of anisotropy $R(H)/R_0$ decreases with fall in temperature and with increase in impurity concentration. It proved always to be greater, other conditions being the same, when the magnetic field was directed along [001] than when directed along [110], the electrical field being along [110] in both cases. The difference between the minimum values of $R(H)/R_0$ for these two orientations decreases in resistivity and in temperature. The authors conclude that this is due to different degrees of anisotropy in impurity and lattice scattering, and also to increasing effec-

Card 1/2

ACCESSION NR: AP4028428

tiveness of interaction between holes as the concentration of holes increases. Orig. art. has: 2 figures.

ASSOCIATION: Institut poluprovodnikov AN UkrSSR,Kiev (Institute of Semiconductors. AN UkrSSR)

SUBMITTED: 08Oct63 DATE ACQ: 27Apr64 ENCL: 00

SUB CODE: EC, SS NO REF SOV: 000 OTHER: 006

Card 2/2

BARANSKIY, P.I.; VINETSKIY, R.M.; KURILO, I.M.

Anisotropy of the Hall coefficient in p-germanium. Fiz. tver. tela 6 no. 4:1048-1050 Ap '64. (MIRA 17:6)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

BARANSKIY, P.I.; VINETSKIY, R.M.

Hall coefficient of p-germanium as a function of the magnetic field strength. Fiz. tver. tela 4 no.1:289-291 Ja '62. (MIRA 15:2)

1. Institut poluprovodnikov AN USSR, Kiyev.
(Hall effect) (Germanium)

33368
S/181/62/004/001/046/052
B112/B138

24,7600 (1035,1043,1137)

AUTHORS: Baranskiy, P. I., and Vinetskiy, R. M.

TITLE: Dependence of the Hall coefficient of p-type germanium on magnetic field strength

PERIODICAL: Fizika tverdogo tela, v. 4, no. 1, 1962, 289 - 291

TEXT: The dependence of Hall coefficient R on magnetic field strength H was determined for two samples of p-type germanium (B_p-1 and B_p-2). In particular, the behavior of R was investigated in the range of low field strengths. The results are shown in the figure. H is given in oersteds, R in 10^4 cubic centimeters/coulomb, ρ of B_p-1 was 8.37 ohm·cm, ρ of B_p - 2,8.82 ohm·cm. The measurements were carried out at room temperature. The experimental results are in good agreement with theory, the error being found to be systematic. There are 1 figure and 7 references: 1 Soviet and 6 non-Soviet. The four most recent references to English-language publications read as follows: W. C. Dunlap. Phys.

Card 1/62

Dependence of the Hall coefficient...

Rev., 79, 286, 1950; W. C. Dunlap. Phys. Rev., 82, 329, 1951; T. C. Harman, R. K. Willardson a. A. C. Beer. Phys. Rev., 94, 1065, 1954; R. K. Willardson, T. C. Harman, A. C. Beer. Phys. Rev., 96, 1512, 1954.

ASSOCIATION: Institut poluprovodnikov AN USSR Kiyev (Institute of Semiconductors AS USSR Kiyev)

SUBMITTED: September 11, 1961

Card 2/2

VINETSKIY, V.L.

PRIKHOT'KO, A.F.

24(7) ∮3 PHASE I BOOK EXPLOITATION SOV/1365

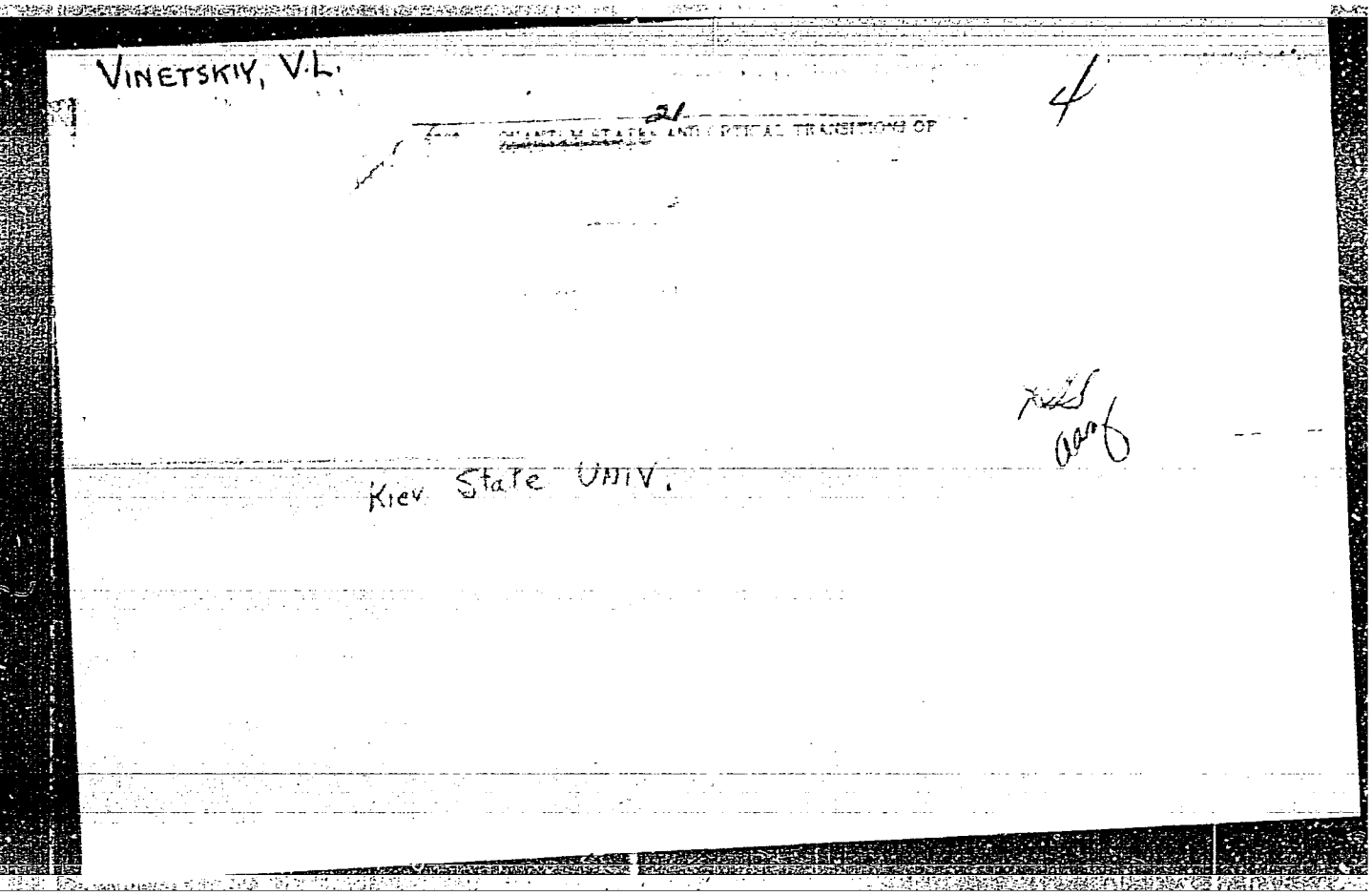
L'vov. Universytet

Materialy X Vsesoyuznogo soveshchaniya po spektroskopii. t. 1: Molekulyarnaya spektroskopiya (Papers of the 10th All-Union Conference on Spectroscopy. Vol. 1: Molecular Spectroscopy) [L'vov] Izd-vo L'vovskogo univ-ta, 1957. 499 p. 4,000 copies printed. (Series: Its: Fizychnyy zbirnyk, vyp. 3/8/)

Additional Sponsoring Agency: Akademiya nauk SSSR. Komissiya po spektroskopii. Ed.: Gazer, S.L.; Tech. Ed.: Saranyuk, T.V.; Editorial Board: Landsberg, G.S., Academician (Resp. Ed., Deceased), Neporent, B.S., Doctor of Physical and Mathematical Sciences, Fabelinskiy, I.L., Doctor of Physical and Mathematical Sciences, Fabrikant, V.A., Doctor of Physical and Mathematical Sciences, Kornitskiy, V.G., Candidate of Technical Sciences, Rayskiy, S.M., Candidate of Physical and Mathematical Sciences, Klimovskiy, L.K., Candidate of Physical and Mathematical Sciences, Milyanchuk, V.S., Candidate of Physical and Mathematical Sciences, and Glauberman, A. Ye., Candidate of Physical and Mathematical Sciences.

Card 1/30

Card 10/30



VINETSKIY, V.L.

4

21

...ANT...M STATES AND OPTICAL TRANSITIONS OF ...

Kiev State Univ.

VINETSKIY, V. L.

56-6-15/56

AUTHOR: DEYGEN, M.F., VINETSKIY, V.L.

TITLE: Interaction between Current Carriers and F-Centers and Acoustical Vibrations of Ionic Crystal Lattices. (Vzaimodeystviye nositeley toka i F-tsentrov s akustitcheskimi kolebaniyami resnetki v ionnykh kristallakh, Russian)

PERIODICAL: Zhurnal Eksperim. i Teoret.Fiziki, 1957, Vol 32, Nr 6, pp 1382-1392 (U.S.S.R.)

ABSTRACT: Theoretically the influence exercised by a "surplus electron" in an ion crystal, the lattice of which was excited optically or acoustically, is investigated. The acoustical case leads to a decrease of the energy of the system, a change of the mass of the current carriers - polaron effect. - In consideration of the condensor effect the wave function, the energy of the ground- and excited states of the F-centers, and the parameters of the F-light absorption bands are calculated. (With 8 Slavic References).

ASSOCIATION: Physical Institute of the Ukrainian Academy of Science

PRESENTED BY:

SUBMITTED: 7.7.1956

AVAILABLE: Library of Congress

Card 1/1

VINETSKIY, V.L.

56-3-26/59

AUTHORS: Vinetskiy, V.L., Giterman, M.Sh.

TITLE: On the Theory of Interaction between "Superfluous" Charges in Ionic Crystals. (K teorii vzaimodeystviya "lishnikh" zaraydov v ionnykh kristallakh)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol. 33, Nr 3, pp. 730-734 (USSR)

ABSTRACT: The interaction between polarones is investigated theoretically. The polarones are the current carriers in an ion crystal and responsible for the electric, photoelectric, and optical properties of these crystals. It is shown that in crystals for which the condition $n^2/\varepsilon \leq 0{,}05$ is satisfied the formation of socalled "bipolarones" is energetically more favorable, they have a limited distance R. Bipolarones are double polarones. These considerations admit to estimate the influence of the interaction of the polarones on the energy of each single one and thus to give the criteria which are necessary for the elimination of such an interaction. This is necessary in order to set up a "many electron theory". There are 3 figures, 1 table, and 6 Slavic references.

ASSOCIATION: [redacted] State University. (Ural'skiy gosudarstvennyy universitet)

SUBMITTED: March 12, 1957.
AVAILABLE: Library of Congress
Card 1/1

VINETSKIY, V. L.

56-3-33/59

AUTHOR: Vinetskiy, V.L.

TITLE: The Optical Properties of the F-Centers.
(Opticheskiye svoystva F -tsentrov)

PERIODICAL: Zhurnal Eksperim.i Teoret.Fiziki,1957,Vol 33,Nr 3,pp 780-787(USSR)

ABSTRACT: The paper contains the following chapters:
1) The basic state of a crystal with an F-center.
2) Excited states of the F-center.
3) Polarized luminescence of the F-centers.
It is theoretically proved in macroscopic approximation that the system crystal + a pair of inhomologous points of defect + an electron is energetically more favorable than a crystal -F- center. The parameters of the ground state of the investigated system are calculated.The frequencies and light absorption coefficients for photo transitions from the lowest excited states are numerically computed by means of the Frank-Kondon approximation method.Further, the azimuthal dependence of the polarization degree on luminescence is determined if this takes place by irradiation with polarized light in the F-band of the absorbed light.
There is 1 figure and 6 Slavic references.

SUBMITTED: March 27,1957
AVAILABLE: Library of Congress.

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APPROVED FOR RELEASE: 09/01/2001 CIA-RDP86-00513R001859820020-6"

VINETSKIY, V. L.

51-4 -1-8/26

AUTHORS: Vinetskiy, V. L. and Deygen, M. F.

TITLE: On Polarized Luminescence of Coloured Crystals. (O polyarizovannoy lyuminestsentsii okrashennykh kristallov.)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol.IV, Nr.1, pp. 60-65. (USSR)

ABSTRACT: This paper is entirely theoretical. It discusses optical transitions to various excited states of F_2 and F_2^+-centres. It is shown that intensity of phototransition to one of the higher energy levels in F_2 and F_2^+-centres is comparable with the intensity of phototransitions (Refs.2,3) to the lower excited levels of the same centres. This means that F_2 and F_2^+-centres may have two absorption bands of approximately the same intensity. The present authors discuss in detail Feofilov's work (Ref.4) on aggregate

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On Polarized Luminescence of Coloured Crystals.

colour centres. Feofilov studied the azimuthal dependence of the degree of polarization of light emitted in luminescence excited by polarized light of wavelengths corresponding to the colour centres. Feofilov gives a classical interpretation of his results based on absorbing and emitting oscillators. The present paper gives a quantum-mechanical interpretation of Feofilov's results. It is shown that the experimental data on the azimuthal dependence of the degree of polarization of luminescence agree with results calculated for F_2 and F_2^+-centres. The discussion is based on the macroscopic approximation (Refs.2,3,5). Quantitative calculations were made for a KCl crystal. There are 1 figure and 10 references,

Card 2/3 of which 8 are Russian and 2 American.

51-4-1-8/26

On Polarized Luminescence of Coloured Crystals.

ASSOCIATION: Institute of Physics of the Academy of Sciences of the USSR, Kiyev (Institut fiziki AN SSSR, Kiyev)

SUBMITTED: March 14, 1957.

AVAILABLE: Library of Congress.

1. Crystals-Luminescence-Polarization

Card 3/3

SOV/56-35-1-45/59

AUTHORS: Vinetskiy, V. L., Deygen, M. F.

TITLE: On the Influence of Acoustic Vibrations on the Parameters of the Bands of the Absorption in Crystals Caused by Admixtures (O vliyanii akusticheskikh kolebaniy na parametry polos primesnogo pogloshcheniya v kristallakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 35, Nr 1, pp. 287 - 289 (USSR)

ABSTRACT: In a previous paper (Ref 1) the authors investigated the system ionic crystal-F-center in a macroscopic approximation and they obtained expressions for the energies of the ground state and of the excited state of the system and also for the parameters of the corresponding absorption band. In this previous paper, the results of a paper by Tolpygo (Ref 2) were used for the calculations. In this paper by Tolpygo, the investigations were carried out in a microscopic approximation. But also a macroscopic investigation is possible for a wide group of crystals, the anisotropy of which is not too intensive. For the crystals which do not satisfy these conditions, numerical computations

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are necessary. The calculations are discussed step by step, and the formulae obtained are given explicitly. The approximation used in this paper may be applied also to the investigation of the behavior of the electron of an impurity center in homeopolar crystals. There are 2 references which are Soviet.

ASSOCIATION: Institut fiziki Akademii nauk USSR (Institute of Physics, AS UkrSSR)

SUBMITTED: April 1, 1958

VINETSKIY, V. L., Cand Phys-Math Sci (diss) --"Some Problems in the theory of current carriers and color centers in ionic crystals". Moscow-Kiev, 1959. 11 pp (Inst of Crystallography, Acad Sci USSR), 200 copies (KL, No 9, 1960, 121)

84608

24.2130 1138, 1144, 1090

S/181/60/002/010/031/051
B019/B056

AUTHOR: Vinetskiy, V. L.

TITLE: The Lowest Quantum States of Current Carriers and Coloring Centers in Ionic and Atomic Crystals

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 10, pp. 2544 - 2556

TEXT: In the present paper the interaction of the carriers and the coloring centers with acoustic vibrations in ion crystals was investigated. Some of the results obtained are also applicable to atomic crystals. The investigation consists in an analysis of the variation-functional, which describes the quantum states of the immobile carriers and coloring centers in ion crystals and atomic crystals taking into consideration the interaction with optical and acoustical vibrations. It was found that the exact functional of the system crystal + conduction electron has a minimum, which corresponds to the negative energy value of the system. This means that the introduction of a conduction electron into the crystal causes the formation of a quasiparticle, which is described as "Polarocondenson". This polarocondenson represents the

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The Lowest Quantum States of Current Carriers and Coloring Centers in Ionic and Atomic Crystals

S/181/60/002/010/031/051
B019/B056

selfconsistent state of the electron in the crystal. The introduced electron deforms in the crystal, thus forming a potential well, which keeps the electron on its steady level. These quasiparticles influence the electrical, optical, and other properties of the crystal. Furthermore, a classification of the states of the polarocondenson is carried out, which is based upon the size of its radius. The author derives criteria for the existence of polarocondensons with large radii. In this case macroscopical investigations of the polarocondenson are possible; relations for physical quantities are derived, which are characteristic for polarocondensons with large radius. Also, criteria for the macroscopical investigation of the coloring centers in ionic and atomic crystals are obtained, in which the interaction of localized electrons with optical and acoustical vibrations of the crystal are taken into account. The author thanks M. F. Deygen for valuable discussions. S. I. Pekar and O. F. Tomasevich are mentioned. There are 4 figures and 13 references: 11 Soviet and 2 US.

SUBMITTED: December 14, 1959

Card 2/2

Vinetskiy, V.L

81916

S/051/60/009/01/011/031
E201/E691

24.3500

AUTHOR: Vinetskiy, V.L.

TITLE: Absorption of Light and Luminescence of M-Centres in the Macroscopic Approximation.

PERIODICAL: Optika i spektroskopiya, 1960, Vol 9, Nr 1, pp 64-69 (USSR)

ABSTRACT: Pekar (Refs 1-3) developed a macroscopic theory of F-centres in ionic crystals which was used to calculate the energy levels and wave functions of these centres and to determine parameters of absorption and luminescence bands. Apart from the F-centres coloured crystals may contain more complex centres such as a combination of an F-centre with a pair of neighbouring vacancies. According to Seitz (Ref 4) such centres are responsible for the M-band of coloured alkali-halide crystals. The present paper reports a calculation of absorption and luminescence parameters using Seitz's model of an M-centre in the macroscopic approximation. The results of a calculation for a KCl crystal did not agree with

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81916

S/051/60/009/01/011/031
E201/E691

Absorption of Light and Luminescence of M-Centres in the Macroscopic Approximation

the experimental value of the M-band maximum (1.5 eV). The reasons for this descrepancy are discussed. There are 1 figure, 1 table and 14 references, 8 of which are Soviet, 4 English, 1 Japanese and 1 translation from English into Russian.

SUBMITTED: September 11, 1959

Card 2/2

24.7700

S/056/61/040/005/017/019
B102/B212

AUTHOR: Vinetskiy, V. L.

TITLE: Bipolar states of carriers in ionic crystals

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, v. 5, 1961, 1459-1468

TEXT: A system consisting of two conduction electrons in an ionic crystal, which interact with the polarization and elastic deformation of the crystal, has been studied. It is shown that the conclusion derived in Ref. 1 (V. L. Vinetskiy, M. Sh. Giterman. ZhETF, 33, 730, 1957) as to the possible existence of bipolar states is also valid when using exact calculation methods. In addition to Ref. 1, the effect of elastic deformation is also taken into account. Such deformations lead to an improvement of the existence criterion and to an increase of the bipolar energy. The solution of the Schrödinger equation for the system consisting of an ionic crystal and two free electrons in adiabatic approximation ($\hbar\omega_{\vec{k}\alpha} \ll \mu c^2/m$, see Ref. 2: S. I. Pekar. Issledovaniya po

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Bipolar states of carriers in ionic crystals

elektronnoy teorii kristallov, Gostekhizdat, 1951; $c = \frac{1}{n^2} - 1/\varepsilon$, n - index of refraction is equivalent to finding the minimum of the corresponding functional by using the approximating wave function

$$\Psi(\ldots \vec{r}_i \ldots q_{\vec{k}\alpha} \ldots) = \psi(\ldots \vec{r}_i \ldots)\,\Phi(\ldots q_{\vec{k}\alpha} \ldots)$$

if the method of Ref. 3 is utilized. Determining the minimum with respect to $\Phi(\ldots q_{\vec{k}\alpha} \ldots)$ leads to the expression

$$\overline{H} = \sum_{k\alpha} \frac{\hbar\omega_{k\alpha}}{2}(2n_{k\alpha}+1) + \min_{\psi} J[\psi], \qquad n_{k\alpha} = 0, 1, 2, \ldots;$$

$$J[\psi] = \frac{\hbar^2}{\mu}\int |\nabla_1 \psi(r_1, r_2)|^2 \, d\tau_{12} + \frac{e^2}{n^2}\int \frac{\psi^2(r_1, r_2)}{|r_1 - r_2|} d\tau_{12} - 2\sum_{k\alpha} \frac{c_{k\alpha}^2 K_{-k\alpha}^2}{\hbar\omega_{k\alpha}}, \quad (4)$$

$$K_{-k\alpha} = -\int |\psi(r_1, r_2)|^2 \chi_{-k}(r_1)\, d\tau_{12}.$$

for the energy of the system, where $\vec{k}(k_1, k_2, k_3)$ denotes the index of normal vibration, $\chi_{\vec{k}\alpha}(\vec{r}) = \sqrt{2/V}\sin(\vec{k}_\alpha \vec{r} + \pi/4)$. First, the wave function

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$$\psi(\vec{r}_1, \vec{r}_2) = \text{const}\cdot[\psi_a(\vec{r}_1)\psi_b(\vec{r}_2) + \psi_a(\vec{r}_2)\psi_b(\vec{r}_1) \qquad \text{(II)}$$

is set up, and only those crystals are considered, for which the interaction of the conduction electron with elastic vibrations can be neglected. Thus,

$$\psi_a(\vec{r}_i) = k^{3/2}\psi_a^0(k\vec{r}_i), \quad \psi_b(\vec{r}_i) = k^{2/3}\psi_b(k\vec{r}_i) \qquad (7),$$

where $\psi_a^0(\vec{r}_i)$, $\psi_b^0(\vec{r}_i)$ are exact electron wave functions of the polaron, and k is the parameter to be varied, and (4) will furnish for the ratio $Q = J_{bipol}/2J_{pol}$ an expression that is a function of R (distance between the points a and b chosen for the approximation of $\psi(\vec{r}_1, \vec{r}_2)$. The energy of the bipolaron is determined by varying this expression with respect to R. The equation

$$Q = 1 + \frac{1}{2}\left(\frac{1}{2}R_1 + \frac{R_3}{6R_1} + \frac{2\pi v_1}{3u_1} + \frac{2u_5}{u_1}\right)R^2 + \ldots \qquad (9)$$

will hold for $n^2\varepsilon = 1$, where

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Bipolar states of carriers in ionic crystals

$$R_3 = \int (\Delta\psi_a)^2 d\tau, \quad u_3 = \int \frac{1}{r_{12}} \psi_a^2(1)\,\psi_a(2) \frac{\partial^2}{\partial r_2^2} \psi_a(2)\, d\tau_{12}. \qquad \text{(III)},$$

$R_1 = \int (\nabla\psi_a)^2 d\tau$, $u_1 = \int \frac{\psi_a^2(1)\psi_a^2(2)}{r_{12}} d\tau_{12}$, $v_1 = \int \psi_a^4 d\tau$. The calculation of the coefficient will succeed with R^2 if the best function is chosen from the exact wave function of the polaron by applying the variational method:

$$\psi(\vec{r}) = 0.1229\alpha^{3/2}(1 + \alpha r + 0.4516\alpha^2 r^2)e^{-\alpha r}, \quad \alpha = 0.6585\mu e^2 o/\hbar^2 \qquad (10).$$

After simple calculations

$$(\partial^2 Q/\partial R^2)_{R=0} = \alpha^2(0.4105 - 0.2062) > 0 \qquad (11)$$

is obtained. Q(R) will decrease if n^2c becomes less than unity; Q(R) can remain above unity if n^2c is sufficiently large. The results obtained for any n^2c agree with those of Ref. 1, which have been found by a semi-classical method. The production of bipolarons is probable at $n^2c > 0.95$ ($Q_{max} = 1.08$ at $n^2c = 1$). Mathematical difficulties will be

Bipolar states of carriers in ionic crystals

encountered if the interaction with the elastic deformation is taken into account. The special case $n^2c = 1$, $R = 0$ is considered for qualitative estimations. Utilizing Ref. 6 (M. F. Deygen, V. L. Vinetskiy. ZhETF, 32, 1382, 1957) and Ref. 11 (V. L. Vinetskiy. FTT, 2, 2544, 1960) will yield

$$J_{\text{бп}}/2J_{\text{п}} > Q(0) = 1 + B \qquad \text{(IV)},$$

where

$$B = \frac{(1-\sqrt{1-\gamma})^2}{\gamma - 2(1-\gamma)(1-\sqrt{1-\gamma})}, \qquad \gamma = \frac{437}{2^{10}\cdot 7\pi}\frac{e^4\mu^4a^2c}{\hbar^4E}. \qquad \text{(V)}$$

From this result it is apparent that interaction can have a considerable effect if the crystal has a large constant a of the deformation potential and a small modulus of elasticity. Finally, the motion of the bipolaron is analyzed with the help of mathematical methods presented in Ref. 12 (S. I. Pekar. ZhETF, 27, 398, 1954) and Ref. 13 (S. I. Pekar. ZhETF, 27, 411, 1954), and the energy of the ground state, the effective mass, and the moment of inertia are calculated. The author thanks M. F. Deygen for discussions, M. I. Kaganov, S. I. Pekar, and other participants of the 4th All-Union Conference on Semiconductor Theory for their interest.

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24717
S/056/61/040/005/017/019
Bipolar states of carriers in ionic crystals B109/B212

F. F. Vol'kenshteyn and V. L. Bonch-Bruyevich are mentioned. There are 15 references: 14 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Institut fiziki Akademii nauk Ukrainskoy SSR (Institute of Physics, Academy of Sciences Ukrainskaya SSR)

SUBMITTED: December 22, 1960

Card 6/6

ACCESSION NR: AT4016300 S/0000/62/000/000/0046/0054

AUTHOR: Vinetskiy, V. L.; Deygen, M. F.; Moroz, A. I.

TITLE: Optical properties of color centers with mirror symmetry

SOURCE: Vses. soveshch. po fiz. shchelochnogaloidn. kristallov. 2nd, Riga, 1961. Trudy*. Fiz. shchelochnogaloidn. kristallov (Physicsof alkali halide crystals). Riga, 1962 46-54

TOPIC TAGS: color center, optics, wave function, adiabatic perturbation theory, ionic crystal, alkali halide crystal, crystallography, crystal optical property, mirror symmetry

ABSTRACT: The authors have undertaken to calculate the wave function $\Psi(r, q_n)$ by consistently employing the adiabatic perturbation theory in zero-approximation. Their purpose was to give a theoretical presentation of the peculiarities which, according to the theory of pseudodegenerated electron-vibratory systems, should exist in the optical properties of the mirror-symmetrical F_2, F_2^+ and M - color centers in ionic crystals. The expression for the energy operator of an ionic crystal with a single-electron, mirror-symmetrical color center is of the form:

$$\hat{H} = T_e + V(r) + \sum_{\varkappa} c_{\varkappa} q_{\varkappa} \chi_{\varkappa}(r) + \frac{\hbar\omega_0}{2} \sum_{\varkappa} \left(q_{\varkappa}^2 - \frac{\partial^2}{\partial q_{\varkappa}^2} \right) + W(r), \quad (1)$$

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ACCESSION NR: AT4016300

This equation which is the initial step of the procedure consists of the following: the first term is the kinetic energy of the color center electron; the second and the third terms are the electron's energy of interaction with vacancies and optical vibrations, respectively; the fourth term is the optical vibration energy; and the fifth term, W(r) is the periodic potential. The article develops this equation and finally arrives at an expression for the absorption coefficient:

$$\tau_l = \sum_{p=1}^{6} \tau_{lp} = \frac{4\pi^2 e^2 \hbar \Omega_l N}{\hbar^2 c_1 n} (1 + \psi_{ab}^0 S_{ab}^0)^{-2} (1 + \psi_{ab}^1 S_{ab}^1)^{-2} \sum_{p=1}^{6} k_p T_{lp}(x_p), \quad (22)$$

где

$$k_1 = k_3 = 2 z_{aa}^2; \; k_2 = z_{ab}^2 + z_{ba}^2; \; k_4 = k_5 = 2 z_{aa} (z_{ab} + z_{ba}); \; k_6 = 2 z_{ab} z_{ba};$$

$$T_{lp}(x_p) = t_p I_l(a_p); \; t_1 = t_3 = S_{aa}^2; \; t_2 = t_6 = S_{ab}^2; \; t_4 = t_5 = S_{aa} S_{ab};$$

$$x_p = \sqrt{n(n+1)}\, a_p.$$

It is seen that the absorption curve consists of six bands whose form and temperature dependence were analyzed in equation (1) above. A comparison shows that the frequency ratios of the six R-bands observed in alkali halide crystals are in good agreement with the expected theoretical ratios. Orig. art. has: 24 formulas and 1 table.

ASSOCIATION: Institut fiziki AN Ukrainskoy SSR (Physics Institute, Academy of Sciences of the Ukrainian SSR)

S/181/63/005/002/051/051
B102/B186

24,7100

AUTHORS: Vinetskiy, V. L., and Kolychev, N. N.

TITLE: Increase in lifetime of nonequilibrium electrons on introduction of adhesion levels

PERIODICAL: Fizika tverdogo tela, v. 5, no. 2, 1963, 694 - 696

TEXT: The effects of acceptor-type adhesion levels on steady-state photoconductivity and carrier lifetime were investigated in FTT, 2, 1545, 1960. Here it is shown that the presence of donor-type adhesion levels causes completely different effects: they may raise the lifetime of the nonequilibrium electrons. In the case of negligibly small dark concentration of electrons, their lifetime $\tau_n^{(i)} = \frac{1}{\gamma_n (S-s_i)}$ is increased when adhesion levels are introduced due to a reduction of (S-s). S is the concentration of recombination levels and s_i their electron population, γ_n is the electron trapping factor for recombination centers. The increase of τ_n is weakened by electron adhesion but not compensated. If the effect of adhesion centers on the dark conductivity is taken into account the lifetime of nonequi-

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Increase in lifetime ...

librium electrons is further reduced. The final result is

$$\delta\tau_n = \tau_n^{(2)} - \tau_n^{(1)} = (s_2 - s_1)\gamma_n^{-1}(S - s_1)^{-1}(S - s_2)^{-1} - \Phi^{-1}(n_2^0 - n_1^0), \quad (3)$$

where Φ is the concentration of electrons produced per sec; the subscripts 1 and 2 refer to a crystal before and after introduction of adhesion centers. Quantitative results can be obtained on solving the equation

$$n(M - m) = mN_{CM};\ \gamma_n(S - s)n = \gamma_p sp = \Phi,$$

$$N_{CM} = N_C \exp\left(-\frac{\varepsilon_M}{kT}\right). \quad (4)$$

with the neutrality condition $n+m+s-p = M_1 + S_1$. N_C is the density of states in the c-band, ε_M the M-level energy, M is the concentration of adhesion levels m their population, n and p are the concentrations of free electrons and holes. For donor levels $M_1 = M$, $S_1 = S$, for acceptor levels $M_1 = 0$ and $S_1 = 0$. For $M_1 = M$, $M \ll S$, $M \ll N_{CM}$ the solution of (4) is

$$\tau_n = \Phi^{-1}[M - n_2^0(T)],\ S_1 = S;\ \tau_n = \frac{1}{\gamma_n S},\ S_1 = 0. \quad (6).$$

In the opposite case ($S \ll M$, N_{CM}) the lifetime for $S_1 = S$ and $S_1 = 0$ is

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$$\tau_n = \Phi^{-1}\left[\frac{2M}{1+\left(1+4MN_{CM}^{-1}\right)^{1/2}} - n_2^0\right] \quad (7).$$

ASSOCIATION: Institut fiziki AN USSR, Kiyev (Institute of Physics AS UkrSSR, Kiyev)

SUBMITTED: October 24, 1962

Card 3/3

VINETSKIY, V.L.; KONOZENKO, I.D.; SHAKHOVTSOVA, S.I.

Analysis of the phenomenon of photocurrent pulse generation by cadmium selenide crystals. Fiz. tver tela 5 no.9:2698-2702 S '63. (MIRA 16:10)

1. Institut fiziki AN UkrSSR, Kiyev.

ACCESSION NR: AP4011752 S/0181/64/006/001/0153/0163

AUTHORS: Vinetskiy, V. L.; Kravchenko, V. Ya.

TITLE: The theory of F centers

SOURCE: Fizika tverdogo tela, v. 6, no. 1, 1964, 153-163

TOPIC TAGS: F center, quantum state, electron, polaron, defect, defect field, energy level, equidistant levels, Jacobian, adiabatic approximation, intermediate coupling, wave function, high mobility subsystem, low mobility subsystem, ground state, excited state

ABSTRACT: The authors have examined the quantum states of F centers in which an electron forms a polaron moving in the field of a defect. They have shown that the lowest state of such a system is characterized by a sequence of equidistant levels, but that excited states are characterized, beginning with some number, by a series of hydrogen-like terms. They have found the Jacobian of the Pekar transformation (S. I. Pekar, Issledovaniya po elektronnoy teorii kristallov, GITTL, M.-L., 1951), which is necessary for computing the matrix elements of the differential processes. It is concluded that the criterion of large-radius approximation is

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ACCESSION NR: AP4011752

better fulfilled the weaker the criterion of adiabatic approximation. Therefore, for a more precise definition of a polaron moving around a defect, one should use the approximation of a high-mobility intermediate coupling, in which the wave function of the high-mobility subsystem must approach expressions such as those used by the authors in the present work. Orig. art. has: 55 formulas.

ASSOCIATION: Institut fiziki AN UkrSSR,Kiyev (Institute of Physics AN UkrSSR); Institut fiziki AN LatvSSR, Riga (Institute of Physics AN LatvSSR)

SUBMITTED: 23May63 DATE ACQ: 14Feb64 ENCL: 00

SUB CODE: PH NO REF SOV: 003 OTHER: 000

Card 2/2

ACCESSION NR: AP4039687 S/0181/64/006/006/1896/1898

AUTHOR: Vinetskiy, V. L.

TITLE: Singlet and triplet states and paramagnetic resonance of double color centers

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1896-1898

TOPIC TAGS: color center, electron paramagnetic resonance, alkali halide

ABSTRACT: The problem is considered of double F-centers (F_2-centers) which differ from the single electron centers by the apparent absence of electron paramagnetic resonance (EPR) in F_2-centers. An involved expression is given from which the energies of the singlet and triplet levels of F_2-centers can be found. The integrals occurring in the expression must be evaluated (using tables), and the energies are then found graphically. As an example, the calculations which are analogous for other alkali halide crystals are carried out for the KCl crystal. It is found that the triplet level is 0.04 ev higher than the singlet level and 0.025 ev above twice the energy of the F-center. In general the triplet state is unstable. It is concluded that the absence of EPR under equilibrium conditions is

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ACCESSION NR: AP4039687

evidence in favor of the model of centers not containing an unpaired electron. The author acknowledges help in the calculations by V. Dmitrashchuk, student at the Chernovtsy University, and T. Kudy*kin, student at the Kiev Polytechnic Institute. Orig. art. has: 17 equations and 1 diagram.

ASSOCIATION: Institut fiziki AN UkrSSR Kiev (Institute of Physics AN UkrSSR)

SUBMITTED: 17Jan64

ENCL: 00

SUB CODE: SS

NO REF SOV: 004

OTHER: 002

Card 2/2

ACCESSION NR: AP4041712 S/0181/64/006/007/2075/2087

AUTHORS: Kravchenko, V. Ya.; Vinetskiy, V. L.

TITLE: Theory of paramagnetic relaxation of F centers in the case of hyperfine and spin-orbit interaction with the lattice

SOURCE: Fizika tverdogo tela, v. 6, no. 7, 1964, 2075-2087

TOPIC TAGS: paramagnetic relaxation, F center, hyperfine structure, spin orbit coupling, phonon, dipole interaction, wave function

ABSTRACT: The probability of one-phonon magnetic relaxation brought about by either spin-orbit or hyperfine (contact and dipole-dipole) interaction is calculated in the adiabatic approximation. Although general calculations of the F-center relaxation time due to spin-orbit interaction have not yet been made, in the case of one-phonon relaxation the calculations are possible, without resorting to any model, and without the need for knowledge of the F-center wave func-

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tion. The relaxation times are expressed directly in terms of experimentally measured constants. General expressions are obtained for the matrix elements of the one-phonon transitions. The shortest contact relaxation time is equal to $3.6 \times 10^9\ T^{-1}H^{-2}$ minutes (H -- magnetic field, T -- temperature). The spin-orbit relaxation time depends on the magnetic field direction and can be much larger, amounting to

$$1.9 \cdot 10^{18} T^{-1} \cdot H^{-4} \left(1 - 0.99 \sum_{\alpha} \frac{H_{\alpha}^4}{H^4}\right)^{-1}, \quad \alpha = x, y, z.$$

The results are analyzed and numerical calculations are made for the KCl crystal. The published experimental relaxation times for this salt vary with the impurity content, and the value given for the purest crystal (1350 sec) comes closest to the theoretically calculated 10^4 sec. "The authors thank M. F. Deygen for many useful discussions." Orig. art. has: 43 formulas.

ACCESSION NR: AP4041712

ASSOCIATION: Institut fiziki tverdogo tela AN SSSR, (Moscow (Institute of Solid State Physics, AN SSSR)

SUBMITTED: 01Feb64 ENCL: 00

SUB CODE: NP NR REF SOV: 004 OTHER: 011

Card 3/3

ACCESSION NR: AP4041706 S/0181/64/006/007/2037/2046

AUTHOR: Vinetskiy, V. L.; Mashkevich, V. S.; Tomchuk, P. M.

TITLE: Theory of stationary radiation induced by interband transitions

SOURCE: Fizika tverdogo tela, v. 6, no. 7, 1964, 2037-2046

TOPIC TAGS: laser effect, laser emission, laser pumping method, stimulated emission, transition frequency

ABSTRACT: A kinetic equation method developed by the author for the analysis of stimulated emission (UFZh v. 8, 918, 1963) is used to determine the parameters of the singular modes at which laser action can be achieved. These parameters are then used to determine the threshold value of the pump signal. It is assumed that only direct transitions are effective, the electron and hole bands are spherical, the electrons and holes have equal effective masses, each band is in

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ACCESSION NR: AP4041706

statistical equilibrium, and the system is spatially homogeneous. It is shown that an important factor in the feasibility of laser action is the spacing of the singular modes, and monochromatic emission is possible in principle if the spacing is large. Future plans call for investigations of induced emission for systems with impurities and the use of x-rays or gamma rays for pumping. Orig. art. has: 56 formulas.

ASSOCIATION: Institut fiziki AN UkrSSR Kiev (Institute of Physics, AN UkrSSR)

SUBMITTED: 24Feb64 ATD PRESS: 3076 ENCL: 00

SUB CODE: EC, GP NR REF SOV: 004 OTHER: 004

Card 2/2

L 11995-65 EWT(1)/EWG(k)/T Pz-6 IJP(c)/ASD(a)-5/AFWL/AS(mp)-2/BSD/ESD(gs) AT
ACCESSION NR: AP4048427 S/0181/64/006/011/3452/3456

AUTHORS: Vinetskiy, V. L.; Kholodar', G. A.

TITLE: "Intrinsic-defect" conduction of semiconductors

SOURCE: Fizika tverdogo tela, v. 6, no. 11, 1964, 3452-3456

TOPIC TAGS: semiconductor conductivity, crystal lattice defect, temperature dependence, crystal lattice vibration, light excitation

ABSTRACT: The "intrinsic defect" conduction is an impurity conduction in which thermal lattice defects act as donors, so that the concentration of donor centers rises exponentially with temperature. A self-consistent theoretical calculation of the intrinsic defect conduction (IDC) is carried out using the Gibbs distribution and allowing for the change in the lattice vibration frequency due to the formation of thermal defects. The influence of impurity centers on the IDC is discussed. The effect of illumination may redistribute

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ACCESSION NR: AP4048427

the electrons between various impurity levels, and this leads to a change in the number of the intrinsic thermal lattice defects. This process is quite slow. As a result, a slow component of the photoconductivity appears (or changes) in the temperature region corresponding to the IDC in darkness. The existence of the IDC has been demonstrated experimentally in the literature for CdS, ZnO, ZnS, PbS, etc., at sufficiently high temperatures. The authors use published data to show that the IDC appears also in Cu_2O above 300K. "The authors thank G. Ye. Pikus for his comments." Orig. art. has: 17 formulas.

ASSOCIATION: Institut fiziki AN UkrSSR (Institute of Physics, AN UkrSSR)

SUBMITTED: 31Mar64 ENCL: 00

SUB CODE: SS NR REF SOV: 001 OTHER: 007

Card 2/2

L 11958-65 EWA(k)/EWT(1)/EEC(k)-2/T/EEC(b)-2/EWP(k)/EWA(m)-2 Po-4/Pf-4/
Pi-4/Pi-4 LJP(c) WG/JHB
ACCESSION NR: AP4046406 S/0056/64/047/003/0902/0913

AUTHORS: Vinetskiy, V. L.; Kravchenko, V. Ya.

TITLE: Adiabatic approximation in the theory of spin lattice interaction of local electronic centers in nonmetallic crystals

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 3, 1964, 902-913

TOPIC TAGS: spin lattice interaction, adiabatic approximation, hyperfine interaction constant, electronic center

ABSTRACT: The authors carry out a consistent and uniform calculation of the hyperfine interaction constants (A_k, B_k), the g-value shift (Δg), and the spin-orbit relaxation time (τ) for single-electron centers in nonmetallic crystals, where the ground state of the local electronic centers is sufficiently removed in energy from the nearest excited state. The approach employed differs from that used by

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ACCESSION NR: AP4046406

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others in that the wave function of the unperturbed Hamiltonian is determined with the aid of the adiabatic approximation of Born and Huang (Dynamical Theory of Crystal Lattices, Oxford, 1954), in the form of an expansion in powers of a small parameter. By expanding also the perturbation operators in powers of the same parameter, it is possible to take successive account of all the terms of equal order of smallness in the matrix elements of the perturbation. The corrections to the electron-vibrational wave functions are then expressed in terms of the zeroth approximation function, which is contained under the integral sign in the final expressions for the unknown quantities. Orig. art. has: 36 formulas.

ASSOCIATION: Institut fiziki Akademii nauk Ukrainskoy SSR (Institute of Physics, Academy of Sciences UkrSSR); Institut fiziki tverdogo tela Akademii nauk SSSR (Institute of Solid State Physics, Academy of Sciences SSSR)

Card 2/3

L 11958-65
ACCESSION NR: AP4046406

SUBMITTED: 28Jan64 ENCL: 00

SUB CODE: NP NR REF SOV: 005 OTHER: 012

Card 3/3

L 24920-65 EEC(b)-2/EEC(k)-2/EWA(k)/EWP(k)/EWT(1)/T/EWA(m)-2 Pf-4/P1-4/P1-4/Fo-4

ACCESSION NR: AP5003406 IJP(c) JHB/WG S/0181/65/007/001/0003/0011

35
33
B

AUTHORS: Kravchenko, V. Ya.; Vinetskiy, V. L.

TITLE: Two-phonon processes in spin-lattice relaxation of F-centers

SOURCE: Fizika tverdogo tela, v. 7, no. 1, 1965, 3-11

TOPIC TAGS: F center, spin lattice relaxation, phonon, relaxation transition, hyperfine interaction, spin orbit interaction, relaxation time

ABSTRACT: A method developed by the authors previously (FTT v. 6, 2075, 1964; ZhETF v. 47, 902, 1964) is used to derive an expression for the probabilities of two-photon relaxation transitions of the F-center electron, induced by the hyperfine and spin-orbit interactions. The calculation procedure is based on applying successfully the adiabatic approximation of Born and Huang (Dynamical Theory of Crystal Lattices, Oxford, 1954), obtaining in this fashion a wave

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function of the system comprising the crystal plus the additional electron, and calculating the matrix elements of the relaxation transitions with the aid of this wave function. The parameters needed for the calculations are listed. The transition probabilities are calculated for both the contact interaction and for the spin-orbit interaction. A sample calculation for KCl shows that the contact relaxation mechanism is the most effective, and that the spin-orbit relaxation depends not only on the direction but also on the magnitude of the magnetic field. Comparison with the probabilities for single-photon transitions shows that two-phonon processes begin to prevail even at temperatures close to 10K. Inasmuch as the present calculations give for the spin-orbit relaxation time a value much larger than the experimental data, it is concluded that the most effective relaxation mechanism is not connected with the processes considered in the article. Orig. art. has: 40 formulas.

ASSOCIATION: Institut fiziki tverdogo tela AN SSSR (Institute of

L 24920-65
ACCESSION NR: AP5003406

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Solid State Physics AN SSSR): Institut fiziki AN UkrSSR, Kiev (In-
stitute of Physics, AN UkrSSR)

SUBMITTED: 15May64 ENCL: 00 SUB CODE: SS

NR REF SOV: 003 OTHER: 011

Card 3/3

L 24762-65 EWA(k)/EWT(1)/EEC(k)-2/T/EEC(b)-2/EWP(k)/EWA(m)-2 Pf-4/Pi-4/Pl-4/
Po-4 IJP(c) JHB/WG

ACCESSION NR: AP5003468 S/0181/65/007/001/0319/0322

39
37
B

AUTHORS: Vinetskiy, V. L.; Kravchenko, V. Ya. 21

TITLE: Single-phonon spin-lattice relaxation induced by optical oscillations

SOURCE: Fizika tverdogo tela, v. 7, no. 1, 1965, 319-322

TOPIC TAGS: spin lattice relaxation, single phonon relaxation, optical oscillations, F center, relaxation time, magnetic field dependence

ABSTRACT: To explain the independence of the spin-lattice relaxation time of the magnetic field, observed by several investigators, the authors propose a mechanism wherein single-phonon transitions are induced by the alternating magnetic field due to the electric dipoles produced by optical lattice vibrations (this mechanism was considered in connection with the theory of nuclear relaxation by

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ACCESSION NR: AP5003468

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Kravchenko in FTT v. 4, 1797, 1962). An approximate calculation of the relaxation time due to this mechanism is presented for the case of the F-center and yields a value for the relaxation time in KCl which is approximately two orders of magnitude larger than the experimental. The reason for the discrepancy is briefly discussed. Methods for refining the calculations are suggested. It is noted in conclusion that even this result is indicative of the fact that the mechanism proposed is one of the most effective for F-centers in KCl at low temperatures. Ways for isolating this mechanism experimentally are mentioned. Orig. art. has: 9 formulas.

ASSOCIATION: Institut fiziki AN UkrSSR, Kiev (Institute of Physics AN UkrSSR); Institut fiziki tverdogo tela AN SSSR, Moscow (Institute of Solid State Physics AN SSSR)

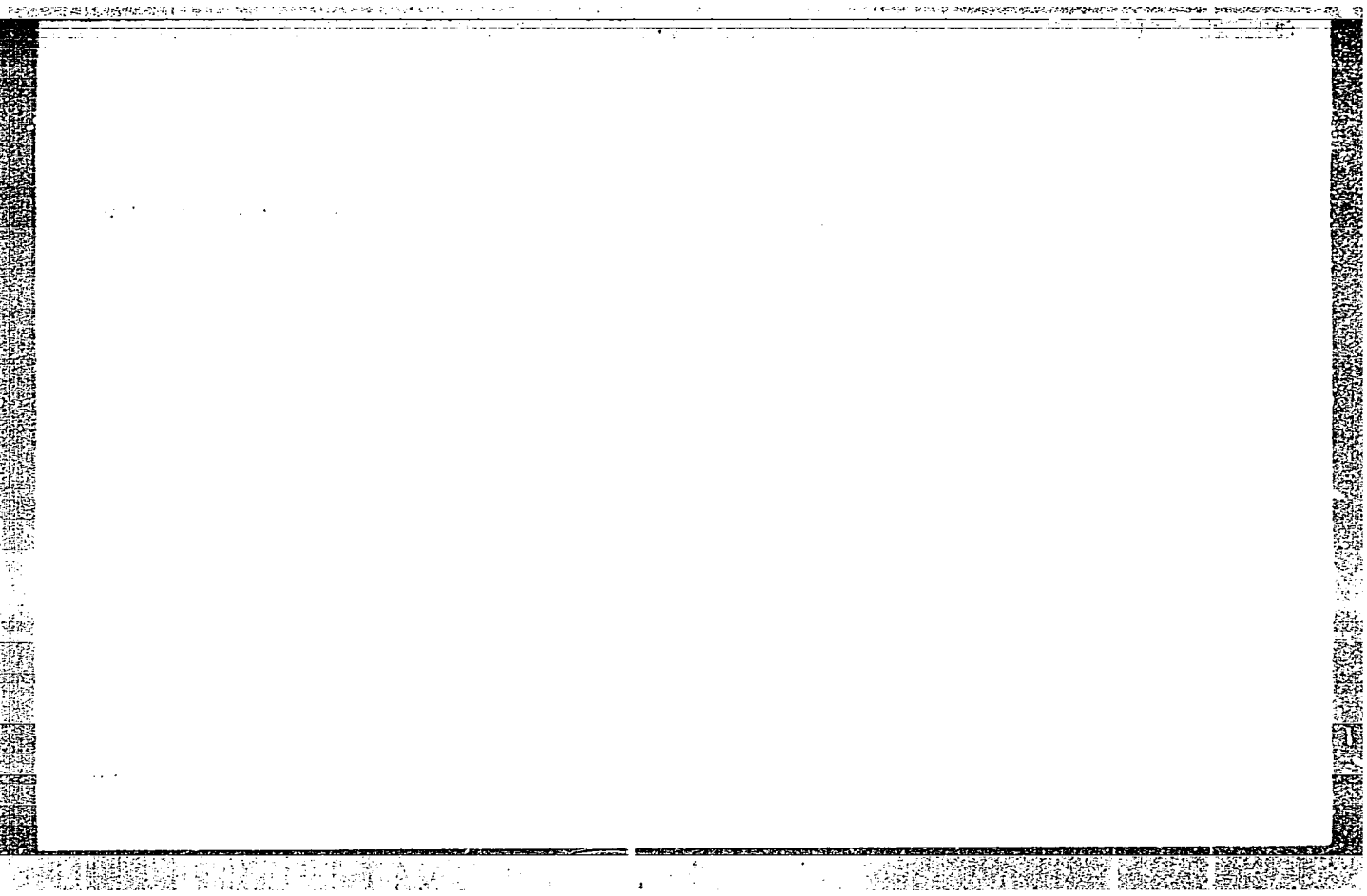
SUBMITTED: 19Aug64 ENCL: 00 SUB CODE: SS

NR REF SOV: 005 OTHER: 003

Card 2/2

TOPIC TAGS: exciton, polaron, crystal polarization, electron polaron, hole polaron

from polarons, with distortion of the potential and wave functions at finite distances between polarons taken into account. Macroscopic approximation was used. The effective mass



APPROVED FOR RELEASE: 09/01/2001 CIA-RDP86-00513R001859820020-6"

L 21176-65 EWT(l)/T/EEC(b)-2 IJP(c)/AFETR

ACCESSION NR: AP5003025 S/0051/65/018/001/0073/0084

AUTHOR: Kravchenko, V. Ya.; Vinetskiy, V. L.

TITLE: Temperature dependence of the parameters of the hyperfine interactions of the F-center electron

SOURCE: Optika i spektroskopiya, v. 18, no. 1, 1965, 73-84

TOPIC TAGS: temperature dependence, hyperfine interaction, interaction parameter, F-center, contact interaction, dipole-dipole interaction, lattice vibration

ABSTRACT: The authors calculate the contact and dipole-dipole parameters of the hyperfine interactions of the F-center electron, and the shift of the g-factor, taking into account the lattice vibrations. It is pointed out that in earlier investigations the ions were assumed stationary and some specific model of the F-center (molecular-orbital, point-like ions, etc.) had to be assumed beforehand. In the approximation used in the present article the contact parameter is determined not by the value of the wave function of the F-center electron in the corresponding site of the ideal lattice, but by the value of the wave function

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ACCESSION NR: AP5003025

averaged over the vibrations, in the ion moving about the equilibrium position. An account of the vibrations leads to a temperature dependence of the hyperfine interaction parameters and of the g-factor shift. The analysis is based on the adiabatic approximation of Born and Huang (Dynamical Theory of Crystal Lattices, Oxford, 1954). The calculations are in agreement with the experimental data. Orig. art. has: 51 formulas.

ASSOCIATION: None

SUBMITTED: 26Feb64 ENCL: 00 SUB CODE: OP, SS

NR REF SOV: 004 OTHER: 012

Card 2/2

VINETSKIY, V.L.; MASHKEVICH, V.S.; TOMCHUK, P.M.

Theory of stationary induced radiation in band-band transitions. Fiz. tver. tela 6 no.7:2037-2046 Jl '64. (MIRA 17:10)

1. Institut fiziki AN UkrSSR, Kiyev.

KRAVCHENKO, V.Ya.; VINETSKIY, V.L.

Theory of the paramagnetic relaxation of F-centers in hyperfine and spin-orbital interaction with the lattice. Fiz. tver. tela 6 no.7: 2075-2087 Jl '64. (MIRA 17:10)

1. Institut fiziki tverdogo tela AN SSSR, Moskva.

VINETSKIY, V.L.; KRAVCHENKO, V.Ya.

Adiabatic approximation in the theory of spin-lattice interaction between local electron centers in nonmetallic crystals. Zhur. eksp. i teor. fiz. 47 no.3:902-913 S '64. (MIRA 17:11)

1. Institut fiziki AN UkrSSR i Institut fiziki tverdogo tela AN SSSR.

L 24380-66 EWT(1) IJP(c) AT
ACC NR: AP6009703 SOURCE CODE: UR/0181/66/008/003/0977/0980

AUTHOR: Vinetskiy, V. L.; Kholodar', G. A.

ORG: Institute of Physics, AN SSSR, Kiev (Institut fiziki AN SSSR)

TITLE: Conductivity of semiconductors due to ionization of thermal lattice defects (intrinsic-defect conductivity)

SOURCE: Fizika tverdogo tela, v. 8, no. 3, 1966, 977-980

TOPIC TAGS: semiconductor conductivity, crystal lattice defect, cuprous oxide, stoichiometry, temperature dependence, carrier density

ABSTRACT: The intrinsic-defect electron or hole conductivity is defined as the conductivity due to the ionization of the thermal defects of the lattice. This is a continuation of earlier work (FTT v. 6, 3452, 1964), where the carrier density occurring in intrinsic-defect conductivity, was calculated. In the present paper the results are presented of measurements of the high-temperature conductivity of cuprous oxide and they are compared with theory. The crystal is assumed to have no foreign impurity atoms, but has at zero temperature a certain number of electrically active defects due to deviation from stoichiometry. It is also assumed that one of the components of the thermal defect is electrically inactive, and that the other is identical with the defect due to the deviation from the stoichometry. The temperature dependence of the carrier density obtained in this manner is found to be approximated by several segments of straight lines, which too correspond to the intrinsic-defect conductivity. The measurements were made in the 300--1250K interval and confirm

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L 24330-66
ACC NR: AP6009703

the hypothesis that at high temperature a semiconductor has an intrinsic-defect conductivity. Orig. art. has: 2 figures and 3 formulas.

SUB CODE: 20/ SUBM DATE: 25Oct65/ ORIG REF: 001/ OTH REF: 003

Card 2/2 ULR

L 25468-66 EWA(h)/EWT(l)/EWT(m)/T/EWP(t) IJP(c) AT/JD
ACC NR: AP6009672 SOURCE CODE: UR/0181/66/008/003/0846/0854

AUTHOR: Kholodar', G. A.; Vinetskiy, V. L.

ORG: Institute of Physics AN UkrSSR, Kiev (Institut fiziki AN UkrSSR)

TITLE: On self-compensation of conductivity in semiconductors

SOURCE: Fizika tverdogo tela, v. 8, no. 3, 1966, 846-854

TOPIC TAGS: semiconductor conductivity, semiconductor band structure, carrier density, crystal defect, impurity conductivity, photoconductivity, electron capture, surface property

ABSTRACT: The semiconductors dealt with in this article are those in which the concentration of the intrinsic defects is large enough to cause their energy levels to play an appreciable role as the impurity levels that determine the equilibrium conductivity of the semiconductor. Particular attention is played to the role of self-compensation in the change in the electric conductivity and other properties of binary semiconductors when their temperature is varied. To this end, the equilibrium concentrations of the carriers and of the intrinsic defects are calculated in doped semiconductors and the results are compared with available experimental data. The results show that allowance for self-compensation must be made when calculating the donor density by means of the usual impurity-conductivity formula. This is confirmed by a check on the experimental results obtained for CdS, CdSe, and Cu_2O. Self-compensation can also play an important role in the case of capture during photocon-

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ACC NR: AP6009672 O

ductivity and other phenomena. It is also pointed out that even if there is no self-compensation inside of a crystal, under certain conditions there may still be self-compensation on its surface and that usually this effect is disregarded in the analysis of the surface properties. Orig. art. has: 1 figure and 16 formulas.

SUB CODE: 20/ SUBM DATE: 31Jul65/ ORIG REF: 003/ OTH REF: 008

Card 2/2 CC

L 25637-66 EWT(d) IJP(c)

ACC NR: AP6016077 SOURCE CODE: UR/0038/65/029/003/0493/0504

AUTHOR: Vinogradov, I. M. (Academician; Chief editor)

ORG: none

TITLE: Problem of evaluating trigonometric sums

SOURCE: AN SSSR. Izvestiya. Seriya matematicheskaya, v. 29, no. 3, 1965, 493-504

TOPIC TAGS: number theory, mathematics

ABSTRACT: In this article a refinement of an earlier theorem of the author characterizing the infrequency of sums of the type

$$\sum_{\rho<x\leq P} e^{2\pi i(\alpha_n x^n+\ldots+\alpha_1 x)}$$

with a sufficiently large modulus is presented. Refinements of its corollaries are also offered. A scheme for application of a special version of the theorem to problems in number theory is indicated in a special example. Five theorems are formulated and proved on the basis of which the following theorem is formulated: Let $n\geq 20$, a and a_1 be integers, $a<a_1\leq 2a$, $t = a^{n-\theta}$, $0<\theta<1$. Then

$$|S|<2a^{\left(1-\frac{1}{16500n^2}\right)}$$

Only the case in which $2/3<\theta\leq 1$ and n is even is investigated. Orig. art. has: 8 formulas. [JPRS]

SUB CODE: 12 / SUBM DATE: 03Mar65 / ORIG REF: 005 UDC: 511

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L 45861-66 EWT(1)/EEC(k)-2/T/EWP(k) IJP(c) WG/GD
ACC NR: AT6015142 SOURCE CODE: UR/0000/66/000/000/0214/0227

AUTHOR: Vinetskiy, V. L.; Kolychev, N. N.; Mashkevich, V. S. 78

ORG: Institute of Physics, AN UkrSSR (Institut fiziki AN UkrSSR); Institute of Semiconductors, AN UkrSSR (Institut poluprovodnikov AN UkrSSR) B+1

TITLE: Theory of laser radiation from impurity-band transitions 15

SOURCE: Respublikanskiy seminar po kvantovoy elektronike. Kvantovaya elektronika (Quantum electronics); trudy seminara. Kiev, Naukova dumka, 1966, 214-227

TOPIC TAGS: laser, solid state laser, semiconductor laser, laser theory, LASER RADIATION, IMPURITY BAND

ABSTRACT: The semiconductor laser operation based on radiative transitions of current carriers from impurity-band state to bound state is examined by the method of kinetic equations. A semiconductor having M identical impurity centers with a level in the forbidden band is considered. Pumping drives the electrons from the valence band into the conduction band. Electron-hole recombination takes place at M levels. Hole capture by an impurity level is accompanied by radiation of a photon. Kinetic equations and a neutral-condition equation are set up. Solutions for the case

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